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CITATION:

Sugimoto, Kaoru. 11. Yellow Series Excitons of Cu_2O in High Magnetic Fields. 物性研究 1990, 54(6): 737-737

ISSUE DATE:

1990-09-20

URL:

http://hdl.handle.net/2433/94187

11. Yellow Series Excitons of Cu_2O in High Magnetic Fields

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The energy levels of hydrogen like atoms in high magnetic fields are not well known. For the purpose of studying the magnetic field dependence, we investigated a series of absorption lines of the yellow series excitons in cuprous oxide crystals. The series is very similar to that of hydrogen atoms.[1-3]

Experiments were carried out at 4.2 and 1.7 K using an optical multi-channel analyzer, and a grating spectrograph with an inverse dispersion of 13.9 A/mm. Magnetic fields were generated in a coil immersed in liquid nitrogen by discharging a 200 kJ condenser bank. Absorption spectra were obtained at the flat part near the peak of the magnetic field. Samples immersed in a liquid helium. The Faraday configuration was used.

The Zeeman splitting of 2p,3p,4f,4p and 5f levels were observed. Their gradients were found to be 0.35, 0.34, 0.32, 0.33 and 0.32 cm^{-1}/T, respectively. The repulsion of absorption lines of the 4p and 5f levels were observed. A minimum difference occurred at B = 16.7 T and the difference was 9.0 cm^{-1}. The minimum energy separation were calculated from its field strength, taking into account of a diamagnetic term. The calculated result was 7.7 cm^{-1} which was in a good agreement with experimental value of 9.0 cm^{-1}.

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